

# *NASA Earth observation satellites enabling new approaches for applications and services*



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Space Administration*



REACH  
NEW  
HEIGHTS

BENEFIT  
ALL  
HUMANKIND

# NASA MISSION OVERVIEW

REVEAL  
THE  
UNKNOWN



# NASA MISSION DIRECTORATES



AERONAUTICS

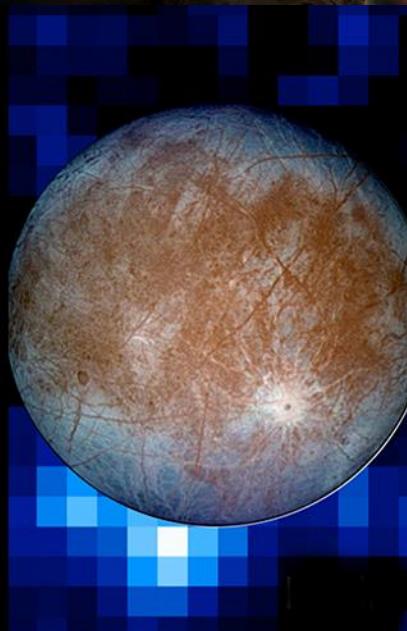
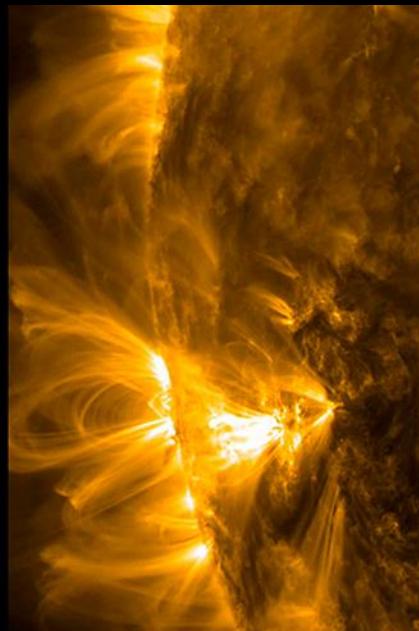
SCIENCE

HUMAN EXPLORATION

SPACE TECHNOLOGY

# SCIENCE MISSION DIRECTORATE

Research Divisions



HELIOPHYSICS

EARTH  
SCIENCE

PLANETARY  
SCIENCE

ASTROPHYSICS



**An Integrated Program of Science**

# FY17 Program of Record

- Formulation
- Implementation
- Primary Ops
- Extended Ops



Sentinel-6A/B (2020, 2025)

Earth Science Instruments on ISS:

CATS, (2020)

LIS, (2020)

SAGE III, (2020)

TSIS-1, (2018)

ECOSTRESS, (2017)

GEDI, (2018)

OCO-3, (2018)

CLARREO-PF, (2020)

TSIS-2 (2020)

MAIA (~2021)  
TROPICS (~2021)  
geoCARB (~2021)

ISS



## InVEST/Cubesats

MiRaTA (2017)

RAVAN (2016)

IceCube (2017)

HARP (2017)

TEMPEST-D (2018)

RainCube (2018\*)

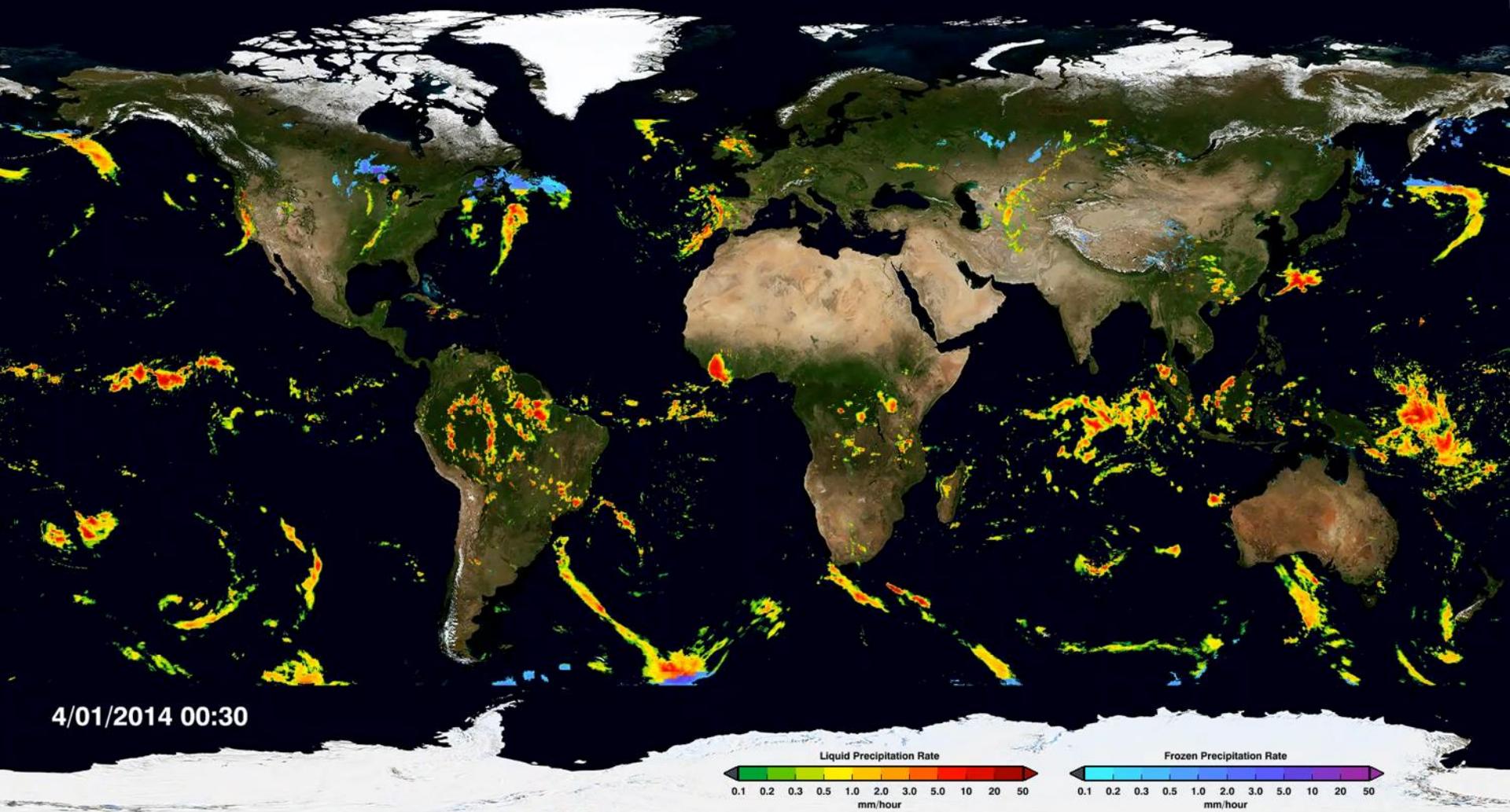
CubeRRT (2018\*)

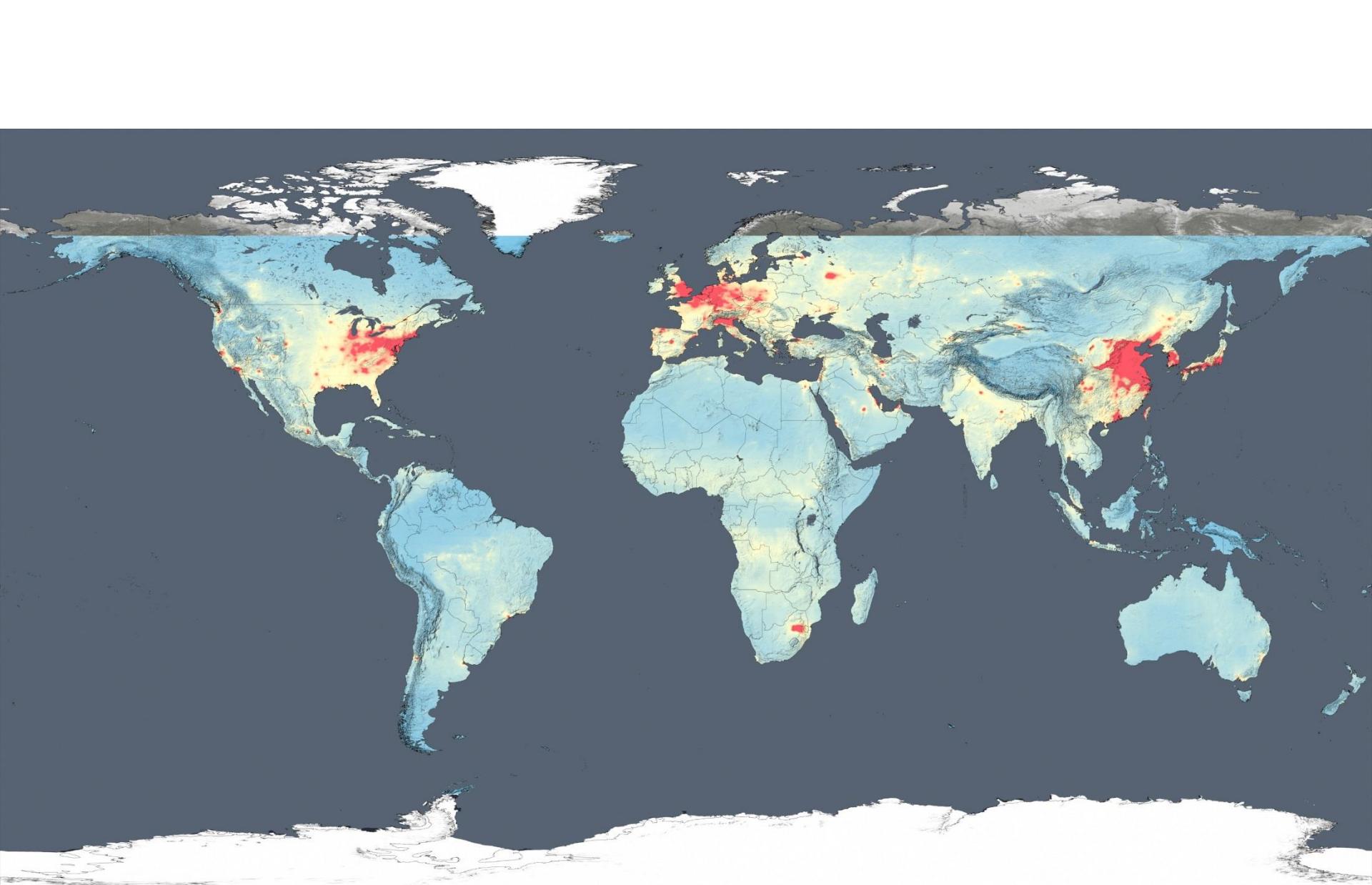
CIRIS (2018\*)

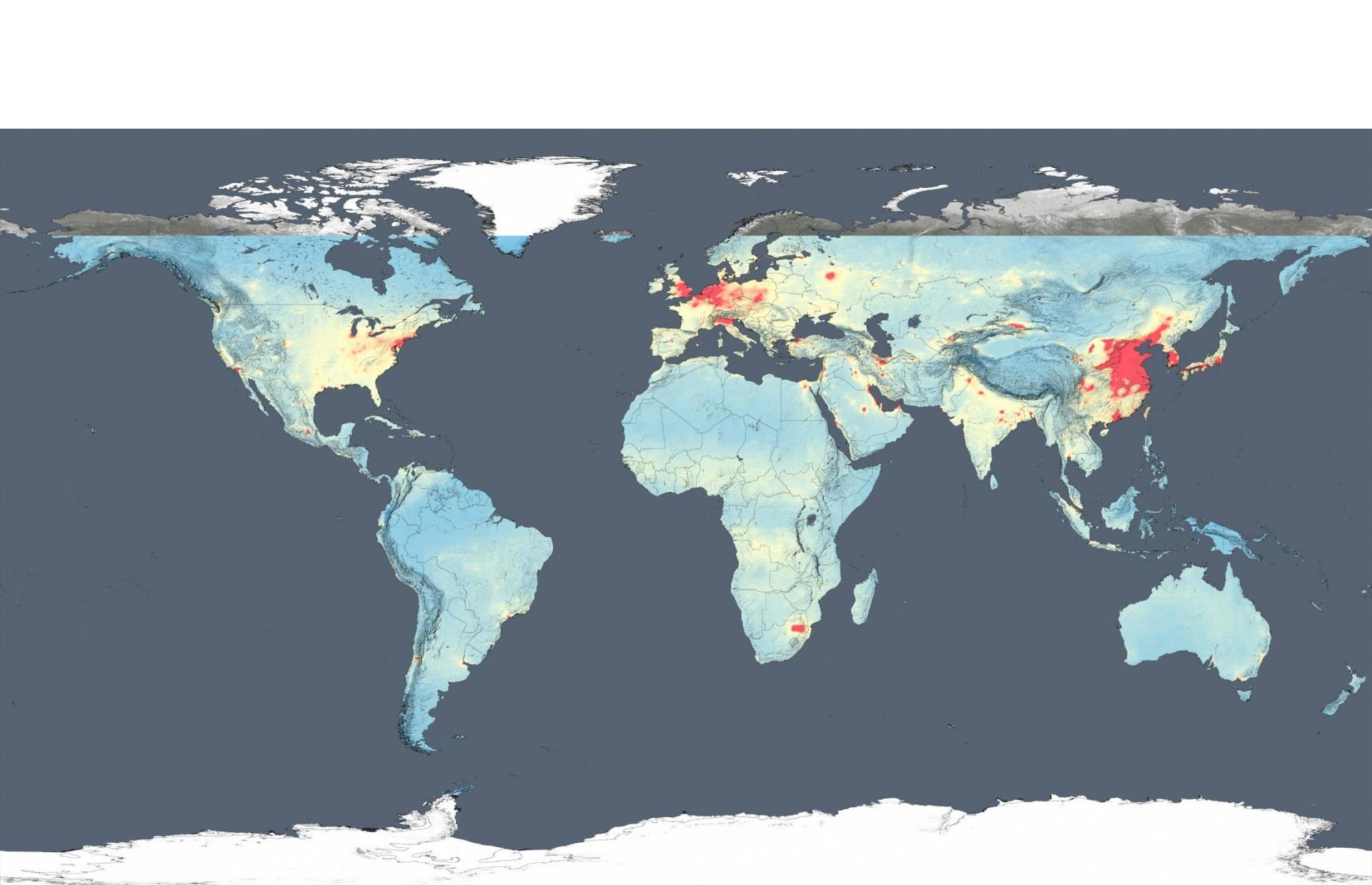
CIRAS (2018\*)

LMPC (---)

\*Target date, not yet manifested







# *NASA supports research to apply earth science to societal needs*

NASA  
Earth Science



## Five Core Applications Areas



Health &  
Air Quality



Water  
Resources



Ecological  
Forecasting



Disasters



Wildland Fires  
(through 2017)

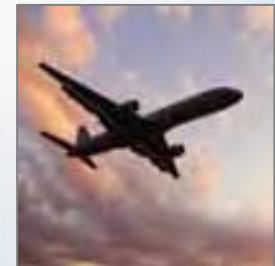
## *Additional Initiatives*



Agriculture / Food Security



Energy



Transportation

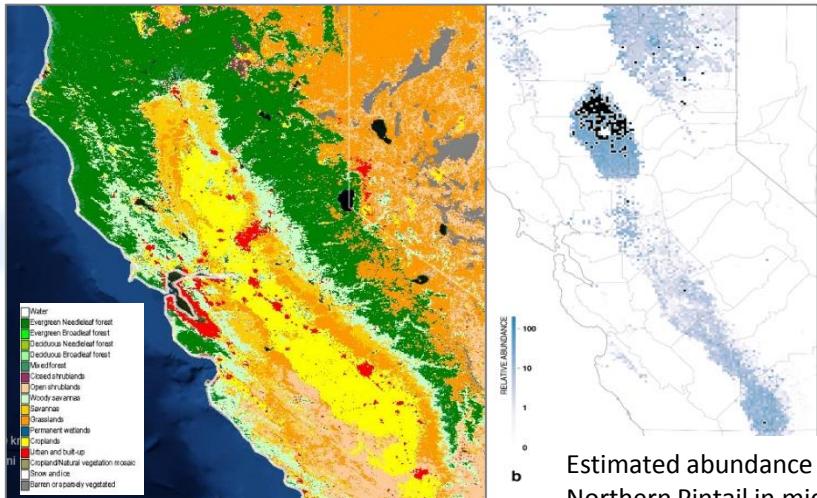
*Climate & weather play into all themes*

# BirdReturns: Earth Obs Informs Reverse Auction to Increase Habitat for Migrating Waterbirds



TEMPORARY HABITAT COSTS  
**LESS THAN ONE PERCENT**  
OF THE PRICE FOR PURCHASING  
CONSERVATION LAND.

300+  
*bird species*  
use the  
Pacific  
Flyway



MODIS and ASTER data combined with citizen science reports from eBird drive bird habitat models and help TNC identify the best bird habitats

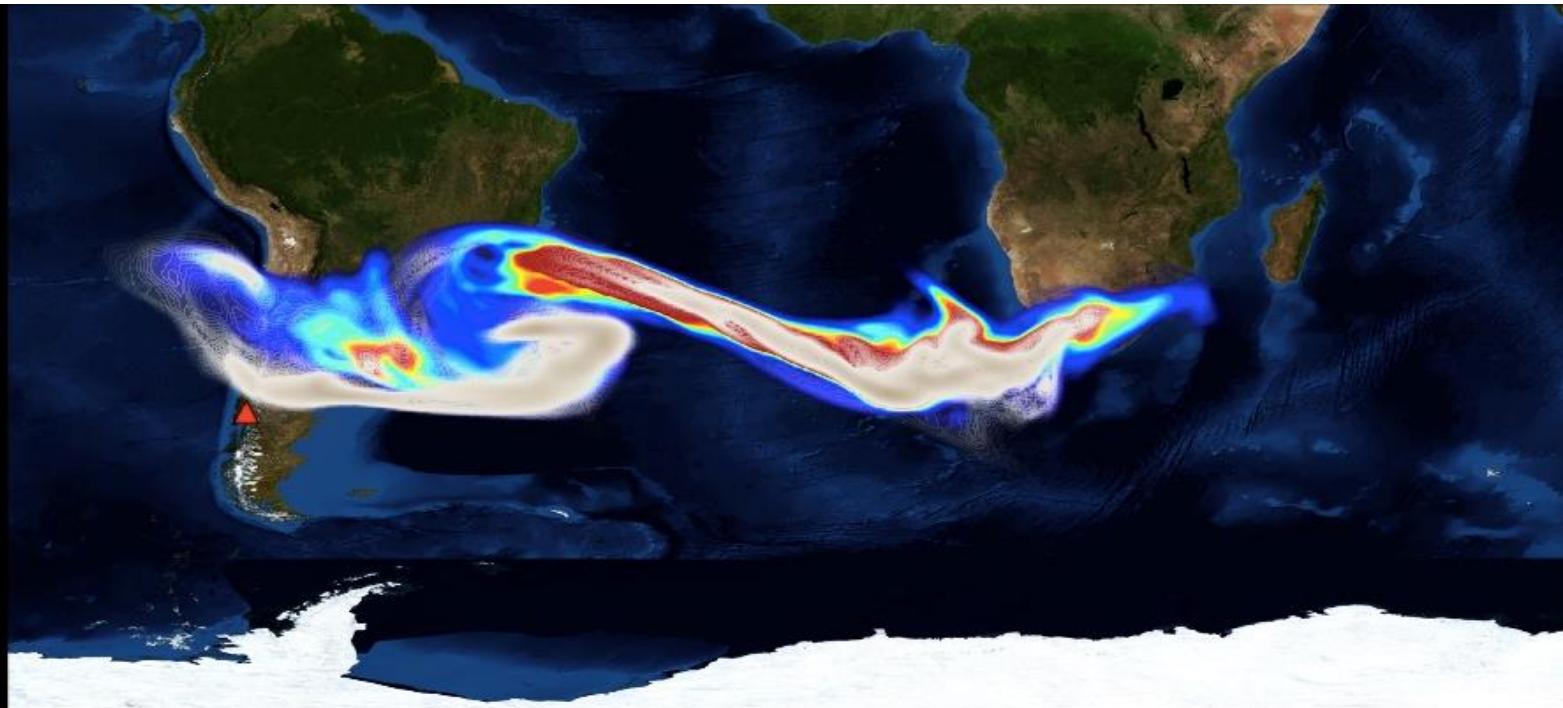
TNC uses a Reverse Auction:

- » Farmers submit bids to flood their fields during spring and fall migration
- » TNC reviews bids on price, migration projections, and other factors
- » TNC selects the best fields to flood for habitat at the best price; pays farmers.
- » And, farmland is only idle during migration

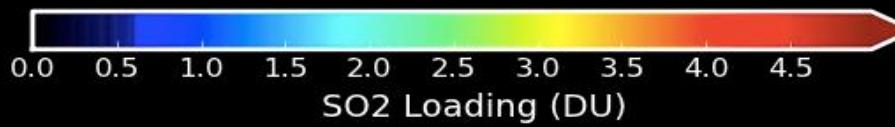
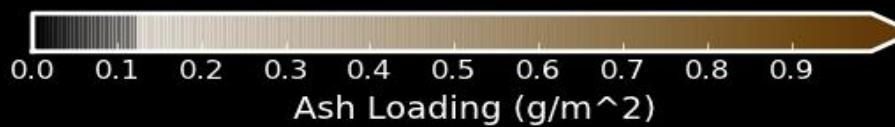
30,000  
acres

*Cumulative total of temporary  
wetlands gained by end of 2015*

**NOAA/NESDIS distributes NASA volcanic SO<sub>2</sub> data from the Aura satellite's Ozone Monitoring Instrument (OMI) to operational users in near real-time.**



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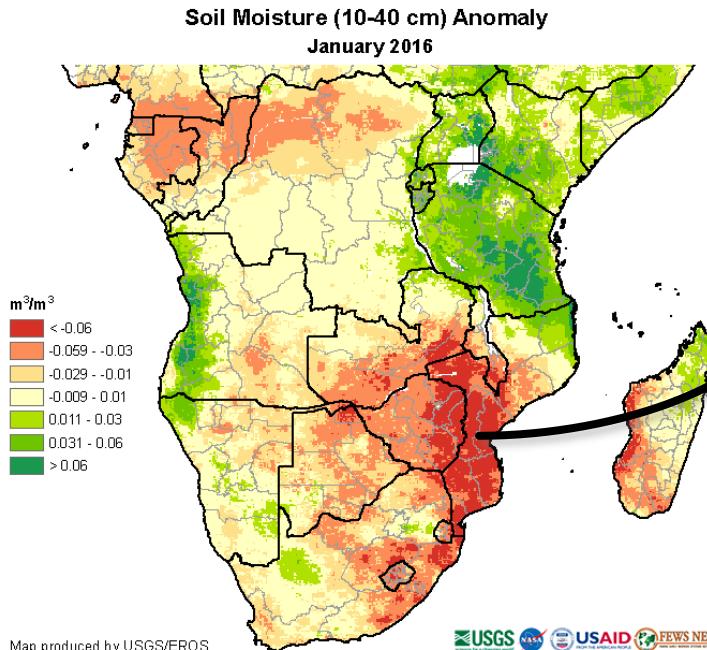
N. Krotkov  
<http://so2.gsfc.nasa.gov>

Goddard  
SPACE FLIGHT CENTER



# Famine Early Warning Decision Support with NASA's Land Information System (LIS)

The Famine Early Warning Systems Network (FEWS NET) uses NASA's Land Information System (LIS) to monitor agricultural and water resources in Africa. The strong 2015/16 El Niño exacerbated drought conditions in Southern Africa (lower left), negatively impacting livestock, crops and food security (lower right).



*"Zimbabwe declares 'state of disaster' due to drought: More than quarter of population face food shortages as country hit by severe drought, with cattle dying and crops destroyed"*

*-The Guardian, 5 February 2016*

Early warning systems help optimize the distribution of limited humanitarian aid resources. NASA satellite datasets are used to corroborate modeled estimates of quantities such as soil moisture. FEWS NET, USAID and USGS use these datasets to create visualizations that meet the needs of the humanitarian community.

# NASA's Capacity Building Program (CBP)

Engaging current and future decision makers in a spectrum of activities to improve skills and capabilities in the United States and developing countries to access and apply NASA Earth science



## ARSET

Online and hands-on  
NASA remote  
sensing training

24 *Led by NASA Goddard*



## DEVELOP

Dual workforce capacity  
building using collaborative  
feasibility projects  
*Led by NASA Langley*



## SERVIR

Building international  
capacity in  
developing countries  
*Led by NASA Marshall*

# Useful sites for NASA Earth Science Data and Products

NASA  
Earth Science



- NASA Earth Science Data: <http://earthdata.nasa.gov>
- NASA Near Real Time Data:  
<http://earthdata.nasa.gov/lance>
- NASA Worldview: <http://earthdata.nasa.gov/worldview>
- Fires: <http://earthdata.nasa.gov/firms>
- Flooding: <http://floodobservatory.colorado.edu/>
- NASA Images and Earth News:  
<http://earthobservatory.nasa.gov>